positioned over a sensor. The number of signals in a given time frame may indicate location, direction, speed and acceleration of the finger on the touch pad **34**, i.e., the more signals, the more the user moved his or her finger. In most cases, the signals are monitored by an electronic interface that converts the number, combination and frequency of the signals into location, direction, speed and acceleration information. This information may then be used by the electronic device to perform the desired control function on the display screen. The sensor arrangement may be widely varied. By way of example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like.

[**0045**] In the illustrated embodiment, the touch pad **34** is based on capacitive sensing. As is generally well known, a capacitively based touch pad is arranged to detect changes in capacitance as the user moves an object such as a finger around the touch pad. In most cases, the capacitive touch pad includes a protective shield, one or more electrode layers, a circuit board and associated electronics including an application specific integrated circuit (ASIC). The protective shield is placed over the electrodes; the electrodes are mounted on the top surface of the circuit board; and the ASIC is mounted on the bottom surface of the circuit board. The protective shield serves to protect the underlayers and to provide a surface for allowing a finger to slide thereon. The surface is generally smooth so that the finger does not stick to it when moved. The protective shield also provides an insulating layer between the finger and the electrode layers. The electrode layer includes a plurality of spatially distinct electrodes. Any suitable number of electrodes may be used. In most cases, it would be desirable to increase the number of electrodes so as to provide higher resolution, i.e., more information can be used for things such as acceleration.

[**0046**] Capacitive sensing works according to the principals of capacitance. As should be appreciated, whenever two electrically conductive members come close to one another without actually touching, their electric fields interact to form capacitance. In the configuration discussed above, the first electrically conductive member is one or more of the electrodes and the second electrically conductive member is the finger of the user. Accordingly, as the finger approaches the touch pad, a tiny capacitance forms between the finger and the electrodes in close proximity to the finger. The capacitance in each of the electrodes is measured by ASIC located on the backside of the circuit board. By detecting changes in capacitance at each of the electrodes, the ASIC can determine the location, direction, speed and acceleration of the finger as it is moved across the touch pad. The ASIC can also report this information in a form that can be used by the electronic device.

[**0047**] In accordance with one embodiment, the touch pad **34** is movable relative to the frame **32** so as to initiate another set of signals (other than just tracking signals). By way of example, the touch pad **34** in the form of the rigid planar platform may rotate, pivot, slide, translate, flex and/or the like relative to the frame **32**. The touch pad **34** may be coupled to the frame **32** and/or it may be movably restrained by the frame **32**. By way of example, the touch pad **34** may be coupled to the frame **32** through axels, pin joints, slider joints, ball and socket joints, flexure joints, magnets, cushions and/or the like. The touch pad **34** may also float within a space of the frame (e.g., gimbal). It should be noted that the input device **30** may additionally include a combination of joints such as a pivot/translating joint, pivot/flexure joint, pivot/ball and socket joint, translating/flexure joint, and the like to increase the range of motion (e.g., increase the degree of freedom). When moved, the touch pad **34** is configured to actuate a circuit that generates one or more signals. The circuit generally includes one or more movement indicators such as switches, sensors, encoders, and the like. An example of a rotating platform which can be modified to include a touch pad may be found in patent application Ser. No. 10/072,765, entitled, "MOUSE HAVING A ROTARY DIAL," filed Feb. 7, 2002, which is herein incorporated by reference.

[**0048**] In the illustrated embodiment, the touch pad **34** takes the form of a depressible button that performs one or more mechanical clicking actions. That is, a portion or the entire touch pad **34** acts like a single or multiple button such that one or more additional button functions may be implemented by pressing on the touch pad **34** rather tapping on the touch pad or using a separate button. As shown in **FIGS. 3A and 3B**, according to one embodiment of the invention, the touch pad **34** is capable of moving between an upright position **(FIG. 3A)** and a depressed position **(FIG. 3B)** when a substantial force from a finger **38**, palm, hand or other object is applied to the touch pad **34**. The touch pad **34** is typically spring biased in the upright position as for example through a spring member. The touch pad **34** moves to the depressed position when the spring bias is overcome by an object pressing on the touch pad **34**.

[**0049**] As shown in **FIG. 3A**, in the upright position, the touch pad **34** generates tracking signals when an object such as a user's finger is moved over the top surface of the touch pad in the X,Y plane. As shown in **FIG. 3B**, in the depressed position (Z direction), the touch pad **34** generates one or more button signals. The button signals may be used for various functionalities including but not limited to making selections or issuing commands associated with operating an electronic device. By way of example, in the case of a music player, the button functions may be associated with opening a menu, playing a song, fast forwarding a song, seeking through a menu and the like. In some cases, the input device **30** may be arranged to provide both the tracking signals and the button signal at the same time, i.e., simultaneously depressing the touch pad **34** in the z direction while moving planarly in the x, y directions. In other cases, the input device **30** may be arranged to only provide a button signal when the touch pad **34** is depressed and a tracking signal when the touch pad **34** is upright. The later case generally corresponds to the embodiment shown in **FIGS. 3A and 3B**.

[**0050**] To elaborate, the touch pad **34** is configured to actuate one or more movement indicators, which are capable of generating the button signal, when the touch pad **34** is moved to the depressed position. The movement indicators are typically located within the frame **32** and may be coupled to the touch pad **34** and/or the frame **32**. The movement indicators may be any combination of switches and sensors. Switches are generally configured to provide pulsed or binary data such as activate (on) or deactivate (off). By way of example, an underside portion of the touch pad **34** may be configured to contact or engage (and thus activate) a switch when the user presses on the touch pad **34**. The sensors, on the other hand, are generally configured to provide continu-